



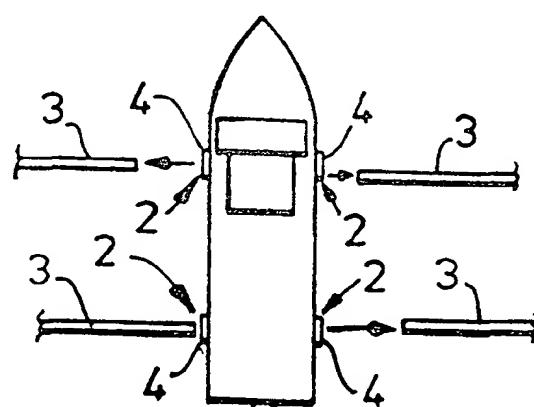
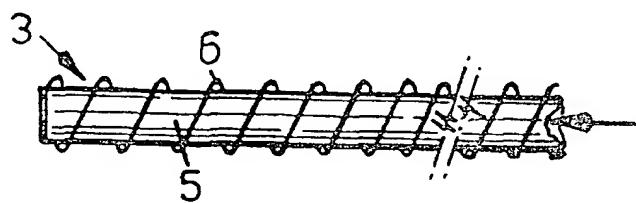
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B63G 13/00, F42B 12/66 // B63G 9/02, F41H 11/00		A1	(11) International Publication Number: <b>WO 99/30966</b> (43) International Publication Date: 24 June 1999 (24.06.99)
(21) International Application Number: PCT/GB98/03742		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 14 December 1998 (14.12.98)			
(30) Priority Data: 9726323.0 12 December 1997 (12.12.97) GB			
(71) Applicant (for all designated States except US): MILLENIUM INNOVATIONS LTD. [GB/GB]; 5 Frederick Place, Weymouth, Dorset (GB).			
(72) Inventor; and			
(75) Inventor/Applicant (for US only): KILVERT, Anthony, David [GB/GB]; 3 Millers Close, Sutton Poyntz, Weymouth, Dorset DT3 6RL (GB).			
(74) Agent: EVERY, David, Aidan; Marks & Clerk, Sussex House, 83-85 Mosley Street, Manchester M2 3LG (GB).			

(54) Title: IMMOBILISER DEVICE

## (57) Abstract

An immobiliser device (2) for a sea-faring vessel (1, 100) has a housing (4, 30, 40) in which is stowed, in an unextended state, a length of fouling wire (6) which, in use, is designed to foul the propeller and/or motor of a target vessel. The wire (6) is automatically ejected from the housing (4) on or soon after contact with the water. The wire (6) may be ejected by being attached to a projectile (34) that is propelled from the housing (30) or may be wrapped around an inflatable member (3). The device (2) allows a first vessel (100) to take action to prevent the approach of a second threatening vessel (102) or to immobilise a fleeing vessel.



BEST AVAILABLE COPY

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

### IMMOBILISER DEVICE

The present invention relates to an immobiliser device for a vehicle locomotive by water such as, for example, a boat or ship.

Security is a constant concern for the crew of a vessel at sea. There have been several reported incidents of the unauthorised boarding of vessels at sea by thieves from another vessel.

It is an object of the present invention to obviate or mitigate the aforesaid problem and improve the security of a sea-faring vessel.

According to a first aspect of the present invention there is provided an immobiliser device for immobilising a vehicle locomotive by water, the device comprising a housing in which there is stored, in an unextended state, an elongate flexible fouling element which, in use, is designed to foul the propeller and/or motor of a target vessel, means for automatically ejecting the fouling element from the housing and means for ensuring the fouling element is maintained in an extended state once ejected from the housing.

The invention improves security by allowing the crew to take action to inhibit the motion of an approaching vessel if they have reason to feel threatened. The immobiliser device is cast into the water in the path of the approaching vessel so that the propeller is engaged by the fouling element. The device can also be used to immobilise a fleeing vessel for whatever reason.

A weight may be conveniently attached to the fouling element so that in use the drag force of the water on the weight ensures that the fouling element is maintained in an extended state. This increases the chances of the fouling element engaging and fouling the propeller.

The fouling element is preferably supported by an inflatable member, which is stowed in or adjacent the housing in a deflated condition, the device further comprising a source of compressed gas releasably connected to the inflatable member in the housing and for inflating the inflatable member so that it floats on water, the inflatable member having, in an inflated condition, the elongate flexible fouling element disposed therearound.

Preferably there is provided a valve between the source of compressed gas and the inflatable member, the valve being opened so as to allow inflation of the inflatable member by removal of a pin from the housing.

At least part of the fouling element may be configured into a net construction and may be supported by support members that extend from the inflatable member.

The housing may contain more than one inflatable member, each member being connected to a common supply of compressed gas.

The housing may comprise a capsule that is designed to be launched from a launch cylinder. Preferably the capsule has a nose that forms the source of compressed gas.

The inflatable member may be stored in the deflated condition in the form of a wound coil.

In a preferred embodiment the fouling element is attached to a projectile member that, in use, is discharged from the housing so as to carry the fouling element out of the housing. The projectile member is designed to float on the water.

According to a second aspect of the present invention there is provided an immobiliser device comprising at least one inflatable member around which is disposed an elongate flexible fouling element, the inflatable member being stored in an deflated condition and connected to a source of compressed gas via a gas distributor, and a valve in the gas distributor that is openable to allow communication between the source of compressed gas and the inflatable member.

Specific embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a schematic representation of the inflatable member of the present invention shown in the inflated condition;

Figure 2 is a diagrammatic plan view of a vessel showing the location of the immobiliser device of the present invention;

Figure 3 is a sectioned side view of a schematic representation of a housing of the immobiliser device;

Figures 4a to 4c are side, front and plan view respectively of a second embodiment of the present invention designed for the stern of a vessel;

Figures 5a and 5b are front and plan views of an third embodiment of the present invention designed for manual operation;

Figure 6 is a diagrammatic representation of the device of figure 5a and 5b, with the inflatable members shown in an inflated condition;

Figure 7 is a plan view of an inflatable member in an inflated condition and shown with a trailing net of fouling wire;

Figures 8a and 8b show views of the inflatable member of figure 7 in a deflated condition;

Figure 9 shows an end view of a fourth embodiment of the present invention in which a plurality of inflatable members are contained in a common housing;

Figures 10 to 14 show alternative embodiments of the fouling wire attached to the inflatable member shown in the inflated condition;

Figure 15 is a schematic view of a fifth embodiment of the present invention;

Figure 16 is a schematic sectioned representation of the device of figure 15, shown in use;

Figure 17 is a front view of the device of figure 16, shown in the water;

Figure 18 is an end view of a tail section of the device of figure 15;

Figures 19 to 21 are sectioned side views of sixth, seventh and eighth embodiments of the present invention respectively;

Figure 22 is a schematic representation of a ninth embodiment of the present invention;

Figure 23 is a front view of a tenth embodiment of the present invention;

Figures 24 to 27 are schematic plan views of different configurations of the device of figure 23;

Figure 28 is a plan view of the device of figure 23 with the inflatable members discharged;

Figure 29 is a perspective side view of the inflatable member of figure 23, the member shown in the deflated condition;

Figure 30 is a diagrammatic plan view of vessel fitted with a plurality of immobiliser devices of the present invention

Referring now to figures 1 and 2 of the drawings, a sea-faring vessel 1 (figure 2) is fitted with a plurality of immobiliser devices 2 of the present invention. Two such devices 2 are disposed on each of the port and starboard sides of the vessel 1 and a further device is disposed on the stern of the vessel 1. Each of the devices 2 stores an inflatable boom 3 that when deployed is inflated and discharged from a housing 4 fitted to the vessel 1. Inflated booms 3 are shown egressing from the vessel 1 in figure 2 and an exemplary boom 3 is shown in figure 1.

The inflated boom 3 comprises a gas-filled flexible tube 5 around which a fouling line 6 is helically wound and connected thereto by means of eyelets (not shown) in a seam of the inflated boom 3. The fouling line 5 is constructed from a strong elongate flexible element such as metallic wire or cable and is designed to foul the propeller or motor of an approaching vessel by entanglement therewith.

Figure 3 shows a typical housing 4 for stowing the deflated boom on the port or starboard locations of the vessel. The housing 4 comprises a cylindrical shell 7 having an axial tubular chamber 8 in which a deflated boom (not shown) is received. The chamber 8 is closed by a removable cap 9 and an end of the boom is releasably connected to a supply of compressed gas 10 via a non-return valve 11 that is fitted in the end of the boom. The supply of gas 10 is controlled by an electronic circuit and a gas distribution solenoid 12 disposed in the housing 4.

In the event of a threatening approach from another vessel, the immobiliser device is actuated by a coded signal from a handset or a control panel on the bridge of the vessel. This causes gas to be released from the supply by the solenoids and fed to the boom via the non-return valve. The boom is inflated by the gas and expands out of the chamber by forcing the cap out of register with the end of the chamber. When the boom is inflated to a predetermined pressure it is automatically released from the non-return valve and escapes from the housing into the water in the path of the target approaching vessel. When the approaching vessel meets the inflated boom the fouling wire wraps around its propeller and/or motor and inhibits its operation thereby

preventing the threatening vessel from approaching further and unauthorised boarding of the vessel in question. The same device can be used to immobilise a fleeing vessel in certain circumstances.

A stern-mounted immobiliser device, shown in figures 4a-4c has two inflatable booms (hidden) disposed in two adjacent chambers of a cylindrical shell 7 that are connected to a supply of gas (not shown) via a common gas distribution block 12.

An alternative manually operated immobiliser device is shown in figures 5a, 5b and figure 6. It has four inflatable booms that are housed in four equi-angularly spaced cylinders 7 whose internal chambers 8 are linked to a common gas supply, control circuit and manual release non-return valve. In use, the device is manually thrown into the path of the approaching vessel and is remotely actuated by pulling on a line 13 that is attached a central pin 14. Removal of the pin 14 opens communication between the gas supply and the booms which then each inflate and extend from the chambers 8 although they remain attached to the device.

Another embodiment of an inflated boom is shown in figure 7 in which the fouling wire 6 is not only wrapped around the boom 3 but is also woven into a net configuration 15 that flanks the boom 3 at one side. The net 15 may optionally be fitted with tow rings 16 by which the boom 3 may be connected to a winch (not shown) of the vessel and used to tow the threatening vessel. The trailing end of the net 15 has weights 17 attached thereto which serve to keep the net 15 extended in the water. In use, the net 15 offers a greater area of potential contact for the approaching vessel.

A deflated boom 3, shown in figures 8a and 8b, is compressed into a flat disc around which the fouling wire 6 is wrapped. Four such booms 3 are shown stored in a common housing 18 in figure 9. The booms 3 are released one at a time from an exit in the end of the housing indicated by the arrow E. Once a boom 3 has been released the others are automatically indexed towards the exit.

Alternative configurations of the fouling wire are shown in figures 10 to 14, each of which is designed to improve the chances of contact of the device with the

approaching vessel. In each embodiment there is an upstanding configuration of wire 20 that is supported by radially extending inflatable portions 21 of the boom 3. This upstanding configuration 20 is designed to come into contact with the bow of an approaching vessel thereby assisting the trailing net to engage the motor or propeller of the vessel. The net 15 is shown in each case with plastic webs 22 filling some of the holes defined by the fouling wire 6. The presence of the plastics webs 22 encourages the net to be drawn to the bottom of the approaching vessel. In addition, fouling wire trails 6 extend from the end of the net and terminate in a weight disc 17 which is subject to drag in the water and therefore ensures that the net is maintained in a downwardly extended configuration in the water.

A remotely controlled immobiliser device is shown in figures 15 to 18. It comprises a capsule 30 having a front nose 31 cone filled with air, a rear section 32 housing two projectiles 34 and an intermediate section 33 that contains fouling wire 35. The projectiles 34 are hollow and fit together to form an annular disc 36 that is releasably received in the rear section 32 of the capsule 30. Each of the projectiles 34 are tied to an end of the fouling wire 35 that is coiled up inside the intermediate section. In use, the capsule floats in the water and as the target vessel approaches, small charges are remotely activated to dispatch the projectiles 34 outwardly of the capsule 30 as shown in figures 16 and 17. The projectiles 34 carry the fouling wires 35 with them and float on the surface of the water when they land. The approaching vessel is stopped by the fouling wires 35 entangling with the propeller and/or motor of the target vessel as described above.

The capsule may be projected into the sea by an appropriate mechanism fitted to the vessel or alternatively may simply be dropped into the water. Instead of being remotely activated the charges may dispatch the projectiles on contact with the water or they may be activated by a timer when a predetermined time has elapsed after the capsule has been dispatched.

Figures 19 to 21 show embodiments of an immobilising device in the form of a capsule but which incorporates the inflatable booms of earlier designs. The capsule in each case is launched from an open ended cylinder 40.

In the design of figure 19 the capsule 41 has a front nose cone 42 behind which there are two deflated booms 43a, b separated by a gas canister 44. Each boom 43a, b is connected to a respective outlet 45 of the canister via a non-return valve 46 integral with the boom. In use, a first non-return valve 46 is opened by releasing the gas from the canister 44 to inflate the rear boom 43a which provides sufficient thrust to launch the capsule 41 from the cylinder 40. When the capsule 41 contacts the water the second non-return valve 46 is opened to inflate the leading boom 43b. Each of the booms 43a, b is again wrapped in a web of fouling wire 47.

In the design shown in figure 20 the capsule 50 contains a single inflatable boom 51 behind a gas-filled nose cone 52. Propulsion of the capsule 50 from the cylinder 40 is provided by a canister 53 of compressed gas that is connected to the rear of the cylinder 40. Once the capsule 50 contacts the water a valve 54 in the nose cone opens to release the gas and to inflate the boom 51.

The embodiment of the immobiliser shown in figure 21 is similar to that of figure 19 except that the inflatable booms 60a, b are stored in a wound spiral configuration (shown in inset figure to the right). The supply of compressed gas to the booms 60a, b is provided by an intermediate gas canister 61 as before and, optionally, by the nose cone 62 (to the leading boom only).

Figure 22 shows an alternative capsule 70 in which fouling wire 71 are stored in a coiled configuration in a cylindrical chamber 72 behind the nose cone 73. The tail ends of the wires 71 are connected to a drag plate 74 which, when the capsule 70 is in the water, pulls the fouling wires 71 out of the capsule 70 and maintains it in an extended form.

A compact hand-held immobiliser is shown in figures 23 to 29. It comprises a pressurised gas canister 80 on which is mounted a gas distributor 81 having an inlet 82 that engages a neck 83 of the gas canister 80. The inlet 82 is connected to four outlet 84 conduits to each of which is connected a deflated boom 85 that is wound in a coil configuration. The end of each boom 85 has an inlet nozzle 85a (see figure 29) that engages in an outlet conduit 84 of the gas distributor 81. An upper surface 86 of the gas distributor 81 has a protruding actuator pin 87 which is pulled to operate the

device. In use, when the pin 87 is removed it opens a valve in the neck 83 of the gas canister 80 and permits gas to flow through the outlet conduits 84 and into each of the booms 85 which uncoil as they inflate. A timer may be provided to delay opening of the valve after removal of the pin 87 to allow the user time to drop the device into the sea before inflation of the booms 85 commences. Alternatively the device may be lowered by a length of cord attached to the pin 87. A short sharp tug on the cord when the device is in place will release the pin 87 and initiate inflation of the booms 85.

The deflated booms 85 can be arranged on the gas distributor 81 in many different configurations and examples are shown in figures 24 to 27.

Figure 28 shows an alternative configuration of gas distributor 91 with outwardly extending arms 92 forming the outlet conduits. The arrows indicate the direction of flow of the gas into the booms (not shown)

The compact immobiliser may be released into the sea automatically from a small housing fitted to the vessel. An example is shown in figure 30 in which the vessel 100 is fitted with a plurality of immobilisers 101 which are automatically released from a housing when an alarm system is triggered. The alarm system may comprises any known form of radar or other monitoring apparatus. When a threatening vessel 102 approaches and is detected by the alarm system the appropriate immobiliser 101 is released from its housing by sending a release signal to a servo that serves to retain the immobiliser in the housing.

It will be appreciated that numerous modifications to the above described design may be made without departing from the scope of the invention as defined in the appended claims. For example, the boom described above may be designed to float by means other than being inflated. It is also preferably designed to be biodegradable over a period of time.

CLAIMS

1. An immobiliser device for immobilising a vehicle locomotive by water, the device comprising a housing in which there is stored, in an unextended state, an elongate flexible fouling element which, in use, is designed to foul the propeller and/or motor of a target vessel, means for automatically ejecting the fouling element from the housing and means for ensuring the fouling element is maintained in an extended state once ejected from the housing.
2. An immobiliser device according to claim 1, wherein a weight is attached to the fouling element so that in use drag force of the water on the weight ensures that the fouling element is maintained in an extended state.
3. An immobiliser device according to claim 1 or 2, wherein the fouling element is supported by an inflatable member, which is stowed in the housing in a deflated condition, the device further comprising a source of compressed gas releasably connected to the inflatable member in the housing and for inflating the inflatable member so that it floats on water, the inflatable member having, in an inflated condition, the elongate flexible fouling element disposed therearound.
4. An immobiliser device according to claim 3 wherein there is provided a valve between the source of compressed gas and the inflatable member, the valve being opened so as to allow inflation of the inflatable member by removal of a pin from the housing.
5. An immobiliser device according to claim 3 or 4, wherein the inflatable member is stored in the deflated condition in the form of a wound coil.

6. An immobiliser device according to any one of claims 3 to 5, wherein the housing contains more than one inflatable member, each member being connected to a common supply of compressed gas.
7. An immobiliser device according to any one of claims 1 to 6, wherein at least part of the fouling element is configured into a net construction.
8. An immobiliser device according to claim 7, wherein the net construction is supported by support members that extend from the inflatable member.
9. An immobiliser device according to any preceding claim, wherein the housing comprises a capsule that is designed to be propelled from a launch tube.
10. An immobiliser device according to claim 9, wherein the capsule has a nose that contains the source of compressed gas.
11. An immobiliser device according to claim 1 or 2, wherein the fouling element is attached to a projectile member that, in use, is discharged from the housing so as to carry the fouling element out of the housing.
12. An immobiliser device comprising at least one inflatable member around which is disposed an elongate flexible fouling element, the inflatable member being stored in an deflated condition and connected to a source of compressed gas via a gas distributor, and a valve in the gas distributor that is openable to allow communication between the source of compressed gas and the inflatable member.

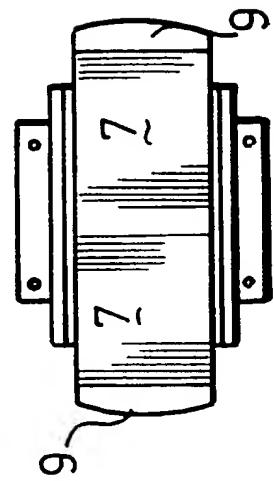
1 - 6

FIG. 4b

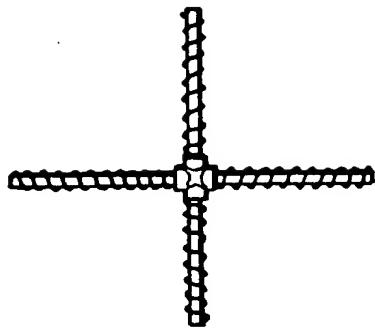


FIG. 6

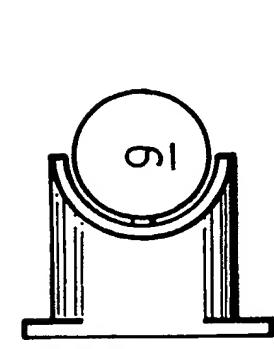


FIG. 4a

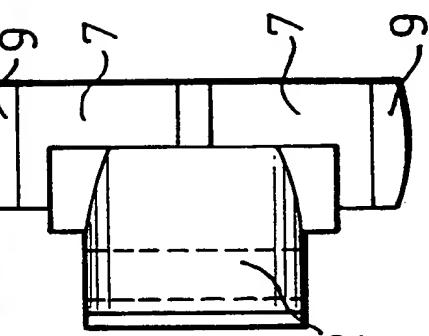


FIG. 4c

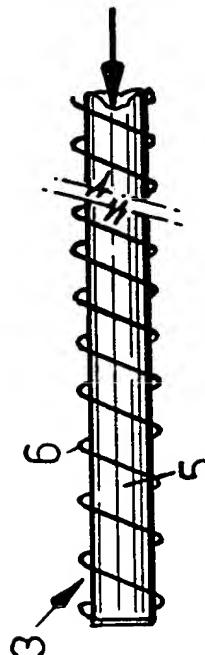


FIG. 1

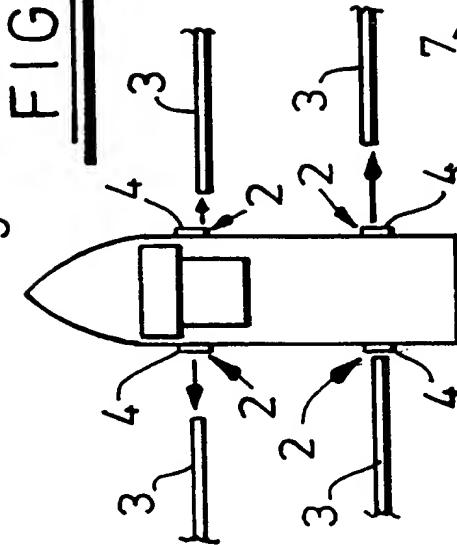


FIG. 2

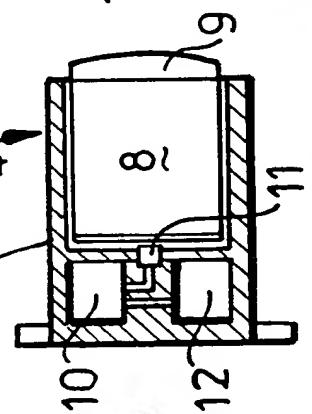
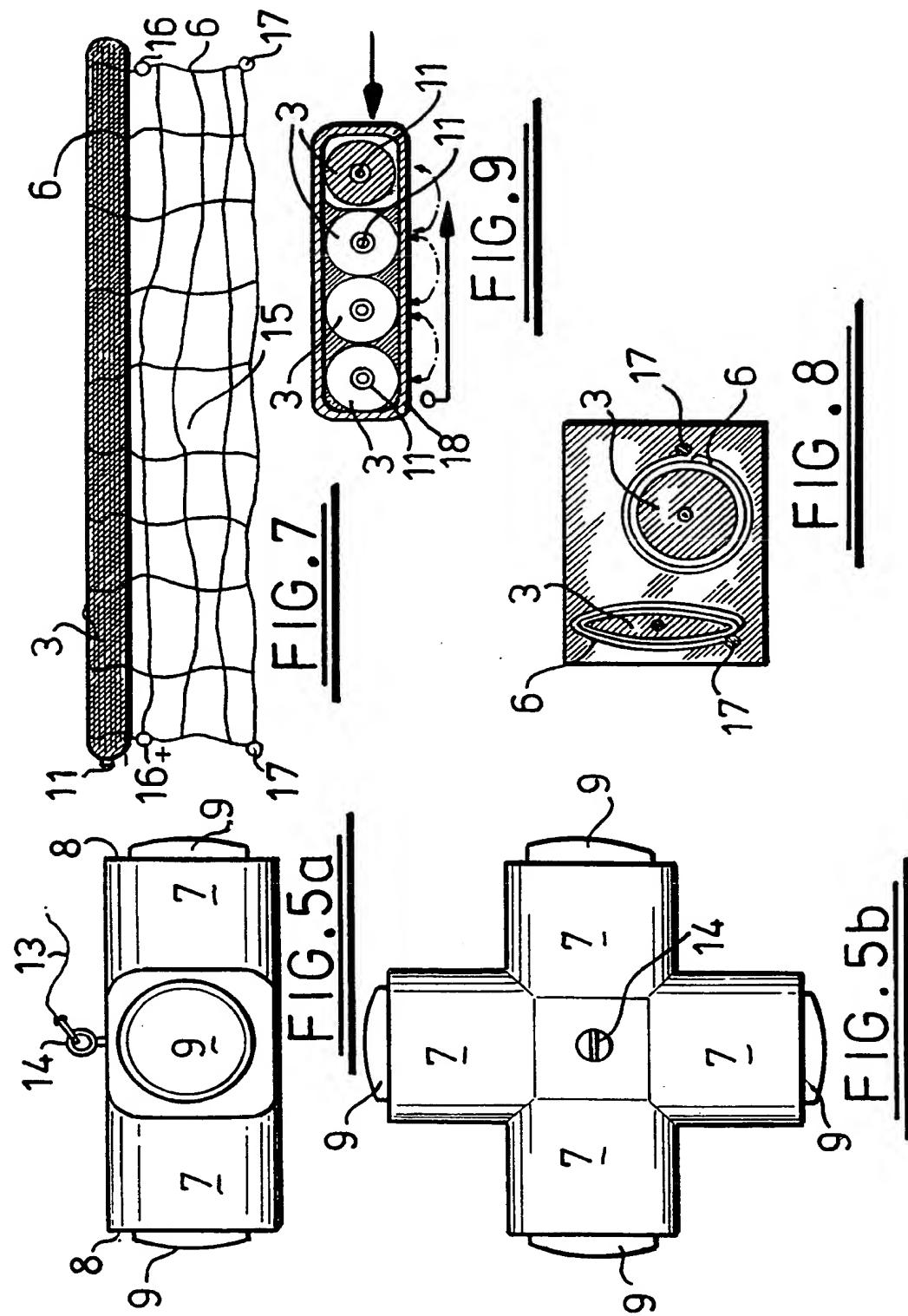
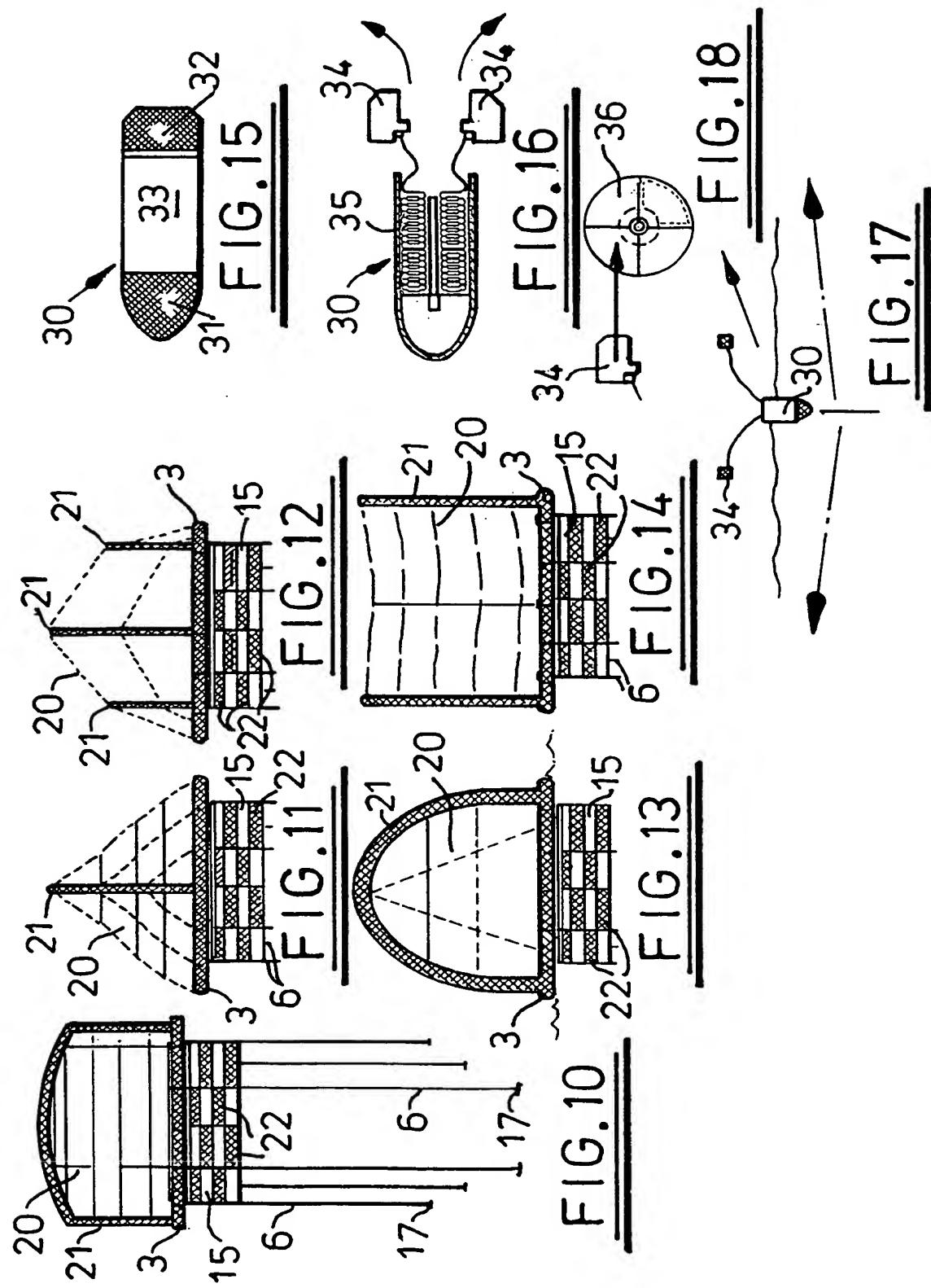


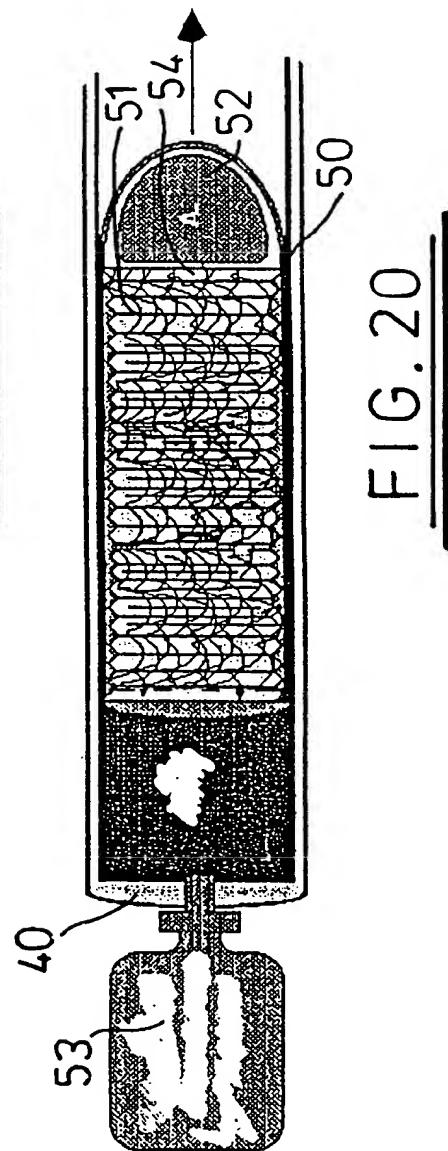
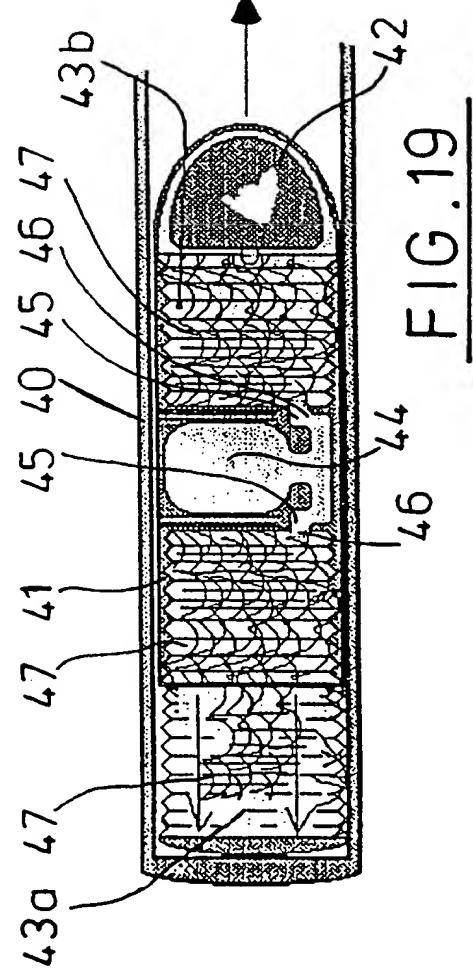
FIG. 3

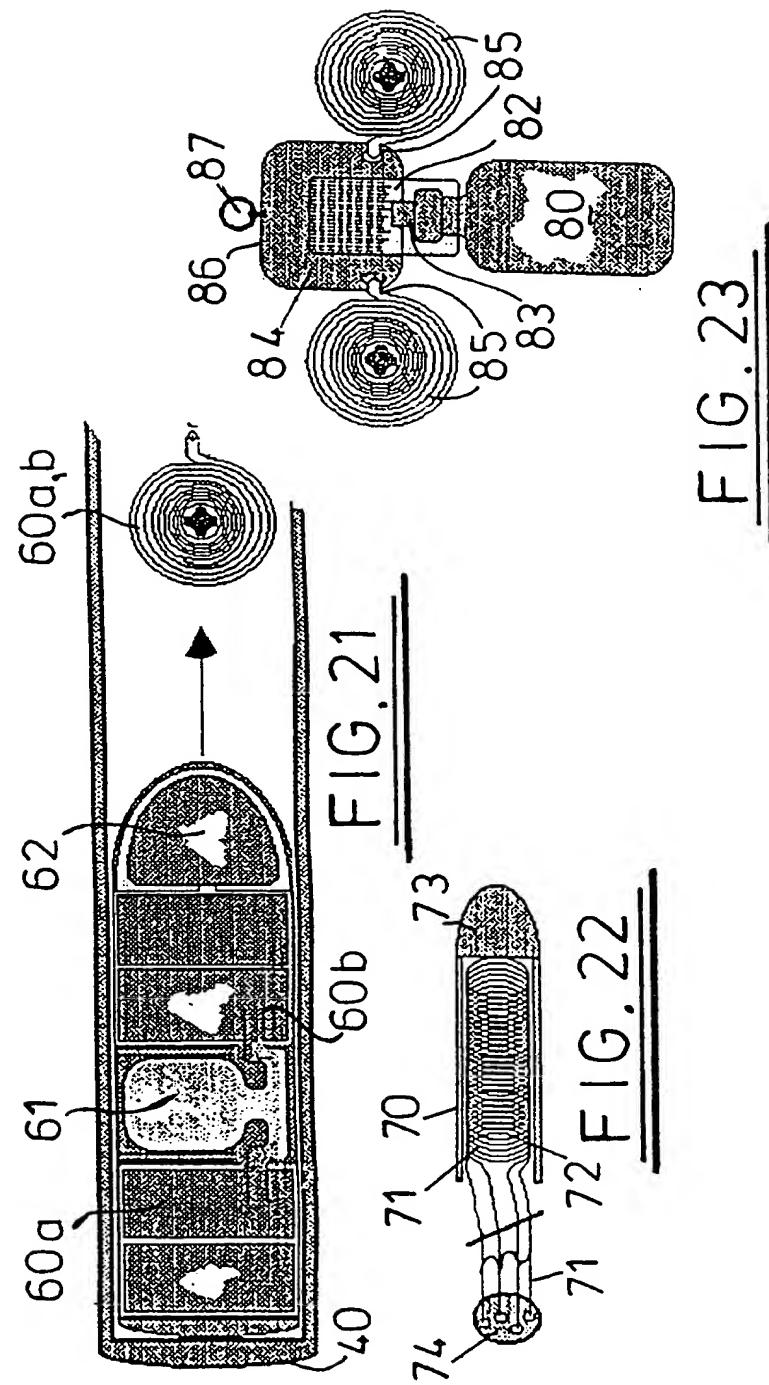
2-6

3 - 6



4 - 6



5 - 6

6-6

FIG. 28

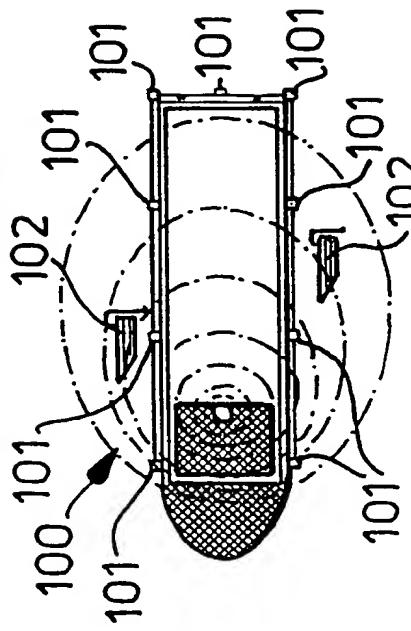


FIG. 30

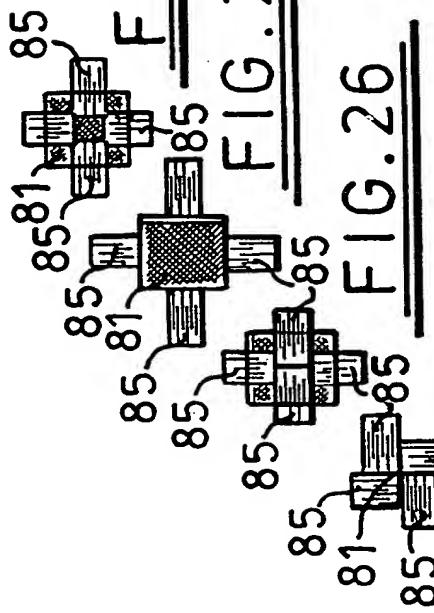


FIG. 27

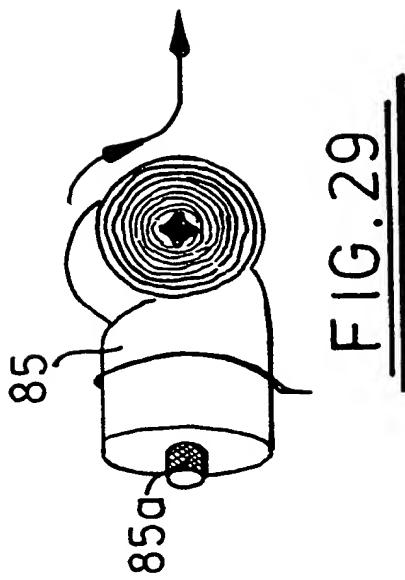


FIG. 29

# INTERNATIONAL SEARCH REPORT

Int. tional Application No

PCT/GB 98/03742

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 6 B63G13/00 F42B12/66 //B63G9/02, F41H11/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F42B B63G F41H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 734 350 A (THOMSON BRANDT ARMEMENTS) 22 November 1996 see abstract; figures 1,4,5,7A,7B see column 2, line 16 - line 25 see page 3, line 13 - line 30 see page 4, line 28 - page 5, line 26	1,2,9,11
Y	---	7
Y	US 4 768 417 A (WRIGHT JAMES E) 6 September 1988 see figures 3,4 see column 2, line 6 - line 10 see column 3, line 15 - column 4, line 5 see column 4, line 26 - line 27	7
A	---	1-3,6,9, 12
	---	-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance  
 "E" earlier document but published on or after the international filing date  
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
 "O" document referring to an oral disclosure, use, exhibition or other means  
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

8 April 1999

19/04/1999

Name and mailing address of the ISA  
 European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Häusler, F.U.

## INTERNATIONAL SEARCH REPORT

Int. ~~lational~~ Application No

PCT/GB 98/03742

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 262 595 A (LONGERICH ERNEST P) 21 April 1981 see figures 1-3 see column 2, line 12 - line 64 ----	1,3,6,7, 9,12
A	US 3 638 569 A (THOMANEK FRANK RUDOLF) 1 February 1972 see claim 2; figures 1-3 see column 4, line 1 - line 8 ----	3,5
A	DE 213 241 C (RECH JEAN) 15 September 1909 see figures 1-4 see page 1, line 11 - line 30 see page 2, line 38 - line 69 ----	1,9
A	US 4 679 504 A (CARPENTER RICHARD H) 14 July 1987 ----	
A	US 1 382 166 A (BLUM CHARLES) 21 June 1921 ----	
A	US 1 377 467 A (CRAWFORD-FROST WILLIAM A) 10 May 1921 ----	
A	CH 382 570 A (STEBBE LEONARD) 30 November 1964 ----	
A	FR 859 282 A (ALGIER JACQUES A) 14 December 1940 -----	

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/03742

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
FR 2734350	A 22-11-1996	SE	8801460 A	23-10-1988
US 4768417	A 06-09-1988	NONE		
US 4262595	A 21-04-1981	NONE		
US 3638569	A 01-02-1972	DE	1703933 A 16-03-1972	
		FR	2014848 A 24-04-1970	
		GB	1259319^A 05-01-1972	
DE 213241	C	NONE		
US 4679504	A 14-07-1987	NONE		
US 1382166	A 21-06-1921	NONE		
US 1377467	A 10-05-1921	NONE		
CH 382570	A	NONE		
FR 859282	A 14-12-1940	NONE		

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**